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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Parent Art Unit: 2651
Alvin M. Despain, et al.	Parent Examiner: D. Davidson
Serial No: Not Assigned	
Filed: Herewith	
For: APPARATUS FOR DEVELOPING A DYNAMIC SERVO SIGNAL FROM DATA IN A MAGNETIC DISC DRIVE AND METHOD	

TRANSMITTAL OF FORMAL DRAWINGS

BOX PATENT APPLICATION
Attn: OFFICIAL DRAFTSPERSON
Commissioner for Patents
P.O. Box 2327
Arlington, VA 22202

Dear Sir:

Enclosed are the formal drawings (8 sheets – Figures 1-13) in the above-captioned case.

Respectfully submitted,

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Date: November 21, 2001

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PRELIMINARY AMENDMENT

BOX PATENT APPLICATION
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P.O. Box 2327
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Dear Sir:

Prior to the first Office Action in the present application, please enter and consider the following amendments and remarks:

IN THE SPECIFICATION:

On page 1, below the title of the invention, please insert the following paragraph:

"This is a continuation of Application Serial No. 09/187,770, filed November 6, 1998, allowed, the disclosure of which is hereby incorporated by reference in its entirety."

IN THE CLAIMS:

Please cancel claim 1.

Please add the following new claims 78-111:

78. A data acquisition and recording system comprising:

a first transducer for detecting signals from a first storage medium embodying data to be acquired, the first transducer defining a first tracking relationship with respect to the first storage medium;

a second transducer for recording signals to a second storage medium, the second transducer defining a second tracking relationship with respect to the second storage medium, the first and second transducers having a fixed spatial relationship with respect to each other;

data recovery circuitry coupled to receive signals detected by the first transducer, the data recovery circuitry deriving recovered data from the detected signals, the data recovery circuitry deriving a measure of errors of the detected signals in relation to the recovered data in a substantially continuous manner, the measure being responsive to an accuracy of the first tracking relationship; and

a servo controller coupled to the data recovery circuitry to receive the measure and generate a position error signal in response to the measure as the data recovery circuitry derives data from the detected signals, the position error signal being indicative of corrections determined for the first and second tracking relationships.

79. The system of claim 78, wherein the first and the second storage medium are a first and a second surface, respectively, of a data storage disc.

80. The system of claim 78, wherein the first and the second storage medium are a first and a second data storage disc, respectively.

81. The system of claim 78, further comprising an actuator for simultaneously adjusting the first and second tracking relationships while maintaining the fixed spatial relationship between the first and second transducers.

82. The system of claim 78, wherein a magnitude of the measure increases for sufficiently large positive and negative errors in the first tracking relationship and the measure has a same sign for both the positive and negative errors in the first tracking relationship.

83. The system of claim 78, wherein the signals detected by the first transducer are encoded with a constraint and the measure is derived from the detected signals in accordance with the constraint.

84. The system of claim 78, wherein the data recovery circuitry calculates the data and error data from the detected signals according to PRML decoding, the measure being derived from the calculated error data

85. The system of claim 78, wherein the data recovery circuitry continuously derives the measure from portions of the detected signals including data.

86. The system of claim 78, wherein the first storage medium includes servo data structures interspersed within the signals embodying data, the servo data structures dedicated to servo operations, the servo data structures readable by the first transducer to provide servo information about the first tracking relationship, the servo controller adjusting the first and second tracking relationships in response to the servo information at predetermined intervals during data acquisition and recording.

87. A data acquisition and recording system, comprising:

a read head for reading a signal representative of data from a first data storage surface, the read head defining a first relative positional relationship with respect to first data storage structures on the first data storage surface;

a write head for recording data on a second data storage surface, the write head defining a second relative positional relationship with respect to second data storage structures on the second data storage surface, the read head and the write head having a fixed spatial relationship relative to each other;

data processing circuitry coupled to receive signals detected by the read head, the data processing circuitry deriving data from the detected signals and generating a measure of errors in the detected signals relative to the derived data, the measure varying with misalignments in the first relative positional relationship in a predetermined manner; and

a servo control system for maintaining the first and second relative positional relationships, the servo control system receiving the measure of errors and generating a position error signal for adjusting positions of the read head and the write head, the position error signal being generated in response to the measure of error while the data processing circuitry derives data from the detected signals.

88. The system of claim 87, wherein the first and the second data storage surface are a first and a second data storage surface, respectively, of a data storage disc.

89. The system of claim 87, wherein the first and the second data storage surface are a surface of a first data storage disc and a surface of a second data storage disc, respectively.

90. The system of claim 87, further comprising an actuator for simultaneously adjusting the first and second relative positional relationship while maintaining the fixed spatial relationship between the read head and the write head.

91. The system of claim 87, wherein a magnitude of the measure increases for sufficiently large misalignments between the read head and the first data storage structure in either of two opposite directions and the measure has a same sign for sufficiently large misalignments in either of the opposite directions.

92. The system of claim 91, wherein the measure is a bit error rate.

93. The system of claim 87, wherein the detected signals are encoded with a constraint and the measure is derived from the detected signals in accordance with the constraint.

94. The system of claim 93, wherein the data processing circuitry decodes the detected signals to derive the data in accordance with a partial response, maximum likelihood methodology.

95. The system of claim 87, wherein the data processing circuitry processes the detected signals in accordance with partial response maximum likelihood (PRML) data processing to derive both the data and errors between the detected signals and the recovered data, the measure being derived from the derived errors.

96. The system of claim 87, wherein the first data storage structure includes plural servo data structures interspersed with the signals embodying data, the servo data structures primarily dedicated to servo operations, the servo data structures readable by the read head and providing servo information about the first relative positional relationship between the read head and the first data storage structure, the control system receiving the servo information and adjusting the first relative positional relationship between the read head and the first data storage structure and the second relative positional relationship between the write

head and the second data storage structure in response to the servo information at predetermined intervals during data acquisition and recording.

97. The system of claim 87, wherein the read head includes magnetoresistive elements.

98. The system of claim 97, wherein the data storage structure is a track on a magnetic storage disk.

99. The system of claim 87, wherein the read head and the write head include integral read and write elements.

100. A data acquisition and recording system comprising:

a first transducer for detecting signals from a first storage medium embodying data to be acquired, the first transducer defining a first tracking relationship with respect to the first storage medium;

a second transducer for recording signals to a second storage medium, the second transducer defining a second tracking relationship with respect to the second storage medium, the first and second transducers having a defined spatial relationship relative to each other;

data recovery circuitry coupled to receive signals detected by the first transducer, the data recovery circuitry deriving recovered data from the detected signals, the data recovery circuitry deriving a measure of errors of the detected signals in relation to the recovered data in a substantially continuous manner, the measure being responsive to an accuracy of the first tracking relationship; and

a servo controller coupled to the data recovery circuitry to receive the measure and generate a position error signal in response to the measure, the position error signal having a magnitude representing a magnitude of a correction to be made to adjust the first and second tracking relationships.

101. A data acquisition and recording system, comprising:

a read head for reading a signal representative of data from a first data storage surface, the read head defining a first relative positional relationship with respect to first data storage structures on the first data storage surface;

a write head for recording data on a second data storage surface, the write head defining a second relative positional relationship with respect to second data storage structures on the second data storage surface, the read head and the write head having a fixed spatial relationship relative to each other;

data processing circuitry coupled to receive signals detected by the read head from the first data storage surface, the data processing circuitry deriving data from the detected signals and generating a measure of errors in the detected signals relative to the derived data, the measure varying with misalignments in the first relative positional relationship between the read head and the first data storage structure in a predetermined manner; and

a servo control system for maintaining the first and second relative positional relationships, the servo control system receiving the measure of errors and generating a position error signal in response to the measure of errors for adjusting positions of the read head and the write head, the position error signal having a magnitude representing a magnitude of the adjustment of position of the read head.

102. Apparatus for extracting and recording data signals comprising:

a first transducer for sensing a first storage medium and generating a first signal representative of data containing at least one constraint from the first storage medium and any errors in the sensed data identified using the at least one constraint, the first transducer defining a first tracking relationship with respect to the first storage medium;

a second transducer for recording data on a second storage medium, the second transducer defining a second tracking relationship with respect to the second

storage medium, the first and second transducers having a defined spatial relationship relative to each other;

an input device responsive to the first signal for generating a control signal containing information about the errors in the sensed data and for extracting a data signal; and

an output device operatively coupled to the input device for receiving the control signal and for performing a control function in response thereto to improve an accuracy of the first and second tracking relationships as a function of an extent of errors in the sensed data, the control function being performed as the first transducer generates the first signal.

103. Apparatus for extracting and recording data signals comprising:

a first transducer for sensing a first storage medium and generating a first signal representative of data containing at least one constraint from the first storage medium and any errors in the sensed data identified using the at least one constraint, the first transducer defining a first tracking relationship with respect to the first storage medium;

a second transducer for recording data on a second storage medium, the second transducer defining a second tracking relationship with respect to the second storage medium, the first and second transducers having a fixed spatial relationship relative to each other;

an input device responsive to the first signal for generating a control signal containing information about the errors in the sensed data and for extracting a data signal; and

an output device operatively coupled to the input device for receiving the control signal and for performing a control function in response thereto to improve an accuracy of the first and second tracking relationships as a function of an extent of errors in the sensed data

wherein the output device is responsive to the control signal to produce a dynamic servo signal to improve an accuracy of the first and second tracking relationships, and wherein the dynamic servo signal is substantially continuously supplied.

104. Apparatus for extracting and recording data signals comprising:

a first transducer for sensing a first storage medium and generating a first signal representative of data containing at least one constraint from the first storage medium and any errors in the sensed data identified using the at least one constraint, the first transducer defining a first tracking relationship with respect to the first storage medium;

a second transducer for recording data on a second storage medium, the second transducer defining a second tracking relationship with respect to the second storage medium, the first and second transducers having a fixed spatial relationship relative to each other;

an input device responsive to the first signal for generating a control signal containing information about the errors in the sensed data and for extracting a data signal; and

an output device operatively coupled to the input device for receiving the control signal and for performing a control function in response thereto to improve an accuracy of the first and second tracking relationships as a function of an extent of errors in the sensed data,

wherein the first transducer includes a magnetoresistive element, the first storage medium has storage locations including a track having a center line, the magnetoresistive element is positioned at a slight offset from the center line of the track in a known direction establishing a predetermined sensor offset, the output device is responsive to the control signal to generate a position error signal representing the magnitude and direction in which the first and second transducers

are to be moved to improve magnetoresistive element alignment relative to the track.

105. A method for reading and writing data in a storage system comprising:

positioning a read element with respect to a first storage medium storing data to be sensed;

positioning the write element with respect to a second storage medium for writing data, the write element and the read element having a predefined spatial relationship with respect to each other;

sensing the first storage medium with the read element to generate a first signal representative of stored data containing at least one constraint and errors introduced during the sensing;

from the first signal, extracting a data signal and generating a control signal containing information about an extent of errors in the first signal;

determining a direction of a position error correction from the first signal; and

based on the control signal and the direction of the position error correction, simultaneously adjusting the positions of the read and write elements with respect to the first and second storage media, respectively, while maintaining the redefined spatial relationship between the read and write elements.

106. A method for using information about an extent of errors in a storage system comprising:

positioning a first transducer for sensing data from first storage locations having stored data containing at least one constraint;

positioning a second transducer for writing data to second storage locations;

producing from the first transducer a first signal representative of the sensed data containing the at least one constraint from the first storage locations and information about errors in the sensed data;

generating in response to the first signal a control signal containing information about the extent of errors in the sensed data;

extracting from the first signal a data signal; and

receiving the control signal and performing a control function in response thereto to reduce a position error of the first transducer by an amount determined by the extent of errors in the sensed data and simultaneously to reduce a position error of the second transducer, the control function being performed as the first signal is produced.

107. The method of claim 106 further comprising producing in response to the first signal a direction and magnitude of a servo signal and using the direction and magnitude of the servo signal to improve alignment of the first and second transducers relative to the first and second storage locations.

108. The method of claim 106 wherein the process of receiving produces in response to the control signal a dynamic servo signal in the form of a substantially continuous servo signal indicative of misalignment of the first transducer relative to first storage locations.

109. The method of claim 106 wherein the control function adjusts the transducer position in a direction to improve transducer alignment relative to the storage locations.

110. The method of claim 106 wherein the process of generating includes:

comparing the extracted data signal containing at least one constraint with an expected data signal containing at least one constraint; and

generating in response thereto the control signal.

111. The method of claim 106 wherein the storage locations are tracks on a rotatable magnetic medium and data are sensed by a magnetic transducer and wherein a servo system is operatively coupled to the magnetic transducer for receiving and responding to the control signal for adjusting the magnetic transducer in a direction to position the transducer in alignment relative to the tracks on the magnetic medium.

REMARKS

Claim 1 is canceled and new claims 78-111 are added. Claims 78-111 are pending in the application. The support for

Favorable consideration of the application is respectfully requested.

If there are any fees due in connection with the filing of this amendment, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: November 21, 2001

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